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ABSTRACT

The Urban Systemic Initiatives (USI) program targets cities with the largest numbers of school-aged children living in poverty, as determined by the 1990 census. The purpose of this paper is to provide evaluation data concerning the development and implementation of a resource teacher program in one of the urban systemic initiative sites. This paper provides evaluation data concerning the development and implementation of a resource teacher program in one of the urban systemic initiative sites during its second year of implementation. The professional development model in this urban systemic initiative is based upon a model presented by Lieberman and Miller. Within the reform of mathematics and science in this large urban district, some elements of the model have been able to manifest themselves and others have presented challenges and struggles. (ASK)

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Reflections of Mathematics/Science Resource Teachers in an Urban Systemic Initiative

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The Urban Systemic Initiatives (USI) program is sponsored by the National Science Foundation. Its purpose is to support "comprehensive and systemic effort to stimulate fundamental, sweeping, and sustained improvement in the quality and level of K-12 science, mathematics, and technology education" (Williams, 1998). The program targets cities with the largest numbers of school-aged children living in poverty, as determined by the 1990 census. USI awards have been granted to 22 of the 25 eligible cities. The first awards were granted to eight cities in 1994. Eight more cities joined the initiative in 1995, four cities in 1996, and an additional two cities in 1998 (Mervis, 1998). The purpose of this paper is to provide evaluation data concerning the development and implementation of a resource teacher program in one of the urban systemic initiative sites.

Background

The Milwaukee Public Schools (MPS) became an urban systemic initiative site in 1996. It is currently in its third year of the National Science Foundation sponsored Milwaukee Urban Systemic Initiative. The initiative has provided an opportunity for the district to examine its mathematics and science programs and to engage many more teachers in professional development in these areas.

MPS is a large urban district with 163 schools; 114 elementary, 22 middle, 18 high, and 9 alternative. MPS has a student population of 106 000 students; 61 percent African-American, 20 percent Caucasian, 12 percent Hispanic, 5 percent Asian, 1 percent American Indian, and 1 percent other. Seventy-five percent of the students receive free lunch.

Program Overview

The Milwaukee Urban Systemic Initiative (MUSI) represents a shift toward a responsive model of systemic change that builds upon strengths and develops the capacity for change. Guiding the MUSI effort is the communities of learners concept. These communitiesóthe classroom, school, district and broader Milwaukee communityówork toward the capacity to change practice as they develop improved instruction and learning. The goals of MUSI include:

- ï Establishing ongoing collaborative vision setting;
- ï Instituting high standards and performance assessments;
- ï Narrowing ethnic, gender, and socioeconomic achievement gaps;
- ï Developing high-content, inquiry-based, technology rich curriculum and instruction; and
- ï Breaking boundaries between classroom and the broader community.

Central to the design of MUSI is the establishment of a cadre of Mathematics/Science Resource Teachers (MSRT). The MSRTs serve as teacher leaders who mobilize the school community to embrace high expectations for all students in mathematics and science and develop effective teaching and learning to achieve those high goals. They also serve as links to the larger district-wide initiative. Every aspect of the MSRTs work is designed to build capacity for change at the classroom level, the school level, and the district level. The major duties and responsibilities of the MSRT include:

- ï Support effective learning in their school communities through a variety of collaborative techniques, including peer coaching, team teaching, demonstrations, and facilitating small and large group meetings and workshops.
- ï Provide school based leadership in forming a vision of mathematics and science learning which embraces high expectations, standards-based instruction, and commitment to principles of equity among the members of the school community.
- ï Foster the use of technology, authentic assessments, and community resources in mathematics and science.
- ï Provide access to current literature, learning activities, and other science and mathematics related resources to members of their school communities.
- ï Learn through independent study, seminars, study groups, networks, courses, and conferences.
- ï Promote interconnections among teachers, students, and other community members district-wide around topics related to mathematics, science, and technology.

Program Implementation

A Mathematics/Science Resource Teacher is a full-time position. Classroom teachers apply for the position and are selected through an application process. Each MSRT, in general, is assigned to work with the staff at two targeted MUSI schools for two years.

A group of elementary, middle, and high schools are targeted during each year of the initiative. Additional schools are brought into the reform effort each year. In 1996-97, 51 schools became the first wave of MUSI schools and 25 MSRTs were selected to work within these schools. In 1997-98, 30 additional schools were identified as the second wave schools and an additional 15 MSRTs were selected.

Each year, the MSRTs participated in a training institute, after which they began working in their schools and on district-efforts. The MSRTs continued to meet once a week for a full day to continue their development, to identify concerns, and to develop strategies.

The Professional Development Model

The model chosen for this initiative is that of Lieberman and Miller (1992). They assert that inservice has become synonymous with training. This implies a deficit model of education. Thus, we do not ascribe to the traditional inservice model, rather we use the community of learners as a framework for this professional development model. The elements of this model have emerged from research and practice and are as follows.

Designed around notions of colleagueship, openness, and trust. This will include active engagement with teachers, counselors, and staff, sharing authority and decision making.

Provide opportunities and time for disciplined inquiry. Opportunity and time will be provided for action research and monitoring of practice. The MSRTs will act as coaches in the inquiry efforts and assist others in developing the capacity to conduct their own action research. These research

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efforts will be driven by teacher needs, be problem based, and be conducted by teachers.

. Focus teacher learning of content in context. The learning activities for teachers will take place in the school setting. Only on occasions when students are not available, will the teachers take part in off-site activities. The school setting provides a context for learning and using the students as a source of knowledge. Ideas can be tried out, tested, and revised on-site. Content and pedagogy will be presented in the context of the school.

Provide opportunities that lead to new leadership roles. As the initiative develops, leadership skills will be introduced in order to develop communities of learners. The content of leadership preparation will include school change, implementation models, and other topics that are needed to assist those schools to develop a culture for change.

Lead to networking activities and coalition building beyond the boundaries of the school. The development of networks will begin at the outset of the initiative. Teachers and other school staff members will be encouraged and assisted in developing coalitions within and between schools. These efforts will facilitate the transition from changing their own school to assisting others in developing the capacity to implement effective science and mathematics programs in their schools.

The MSRTs are colleagues, helpers, and developers. The essence of the MSRT role is collegiality and collaboration in an evaluation-free context. MSRTs work closely with individual teachers through disciplined inquiry, team teaching, and peer coaching. In addition, MSRTs have opportunities to further develop their own knowledge base in mathematics and science which will benefit their schools and the district. Their knowledge base will grow through: (1) the act of sharing and learning with other MSRTs at weekly meetings, (2) participation in networks, forums, and symposia sponsored by MUSI, and (3) independent projects in the areas of mathematics, science, and technology.

Leadership in this model must be collaborative. In addition, it cannot be assumed that teacher leaders will be prepared to lead immediately after being designated as a leader. Thus, a major focus of this project has been to develop the MSRTs as informed participatory leaders. Using Barth (1990) terminology, the MSRTs have to become a community of leaders. In addition to their participation as leaders in their schools, they participate as a group to acquire, share, and evaluate current knowledge including content, pedagogy, and leadership skills. Loucks-Horsley, Hewson, Love, & Stiles (1998) pose the question, "Is leadership development a goal of the professional development program or initiative?" Their answer was "yes" since both science and mathematics education professions have identified leadership as a component for preparing to deliver new standards (NCTM, 1989, 1991; NRC, 1996). They further point out that teacher leaders must have a clear vision of what is to be done, believe in it, and be given the opportunity to develop as leaders.

Procedures

Near the conclusion of the second year of implementation, the Mathematics/Science Resource Teachers (MSRT) completed a questionnaire by responding to a series of selected-response and free-response items. The questionnaire provided the MSRTs with an opportunity to reflect on their accomplishments and work during the second year of MUSI implementation and provided the MUSI leadership team with input to inform their discussions and planning for the third year of implementation.

Participants

The participants in this evaluation study were the cadre of MSRTs. Initially, the cadre of MSRTs was comprised of 40 individuals for the second year of MUSI implementation and there were 81 targeted MUSI schools. At the time of the administration of this questionnaire, the cadre of MSRTs was comprised of 38 members as two MSRTs had left the cadre for various reasons. These 38 MSRTs worked with 77 schools. Thirty-seven MSRTs returned their responses to the questionnaire for a response rate of 97.4 percent. Nineteen of the respondents had been a MSRT for one year and the other 18 respondents had been a MSRT for two years. The data represents information on 74 schools.

Instrument and Data Analysis

The questionnaire was designed to reflect the objectives, responsibilities, and duties of MSRTs. It included 37 selected-response items and nine free-response items (see the Appendix for a copy of the instrument).

Part 1 of the questionnaire was comprised of the selected-response items. Eighteen items asked MSRTs to indicate how many times an action was carried out in each of their schools. Response categories included the following: Daily, Weekly, Monthly, Once or twice a semester, Yearly, Did not do this strategy. Seven items assessed the degree to which the MSRTs agreed or disagreed with statements centered around staff engagement and 11 items assessed the degree to which MSRTs agreed or disagreed with statements about their personal concerns. Response categories included the following: Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree. Frequencies were determined for the selected-response items and, where appropriate, means and standard deviations were calculated.

Part 2 of the questionnaire contained nine free-response items. The MSRTs were asked to identify the accomplishments, activities, and challenges concerning their role. They were to asked to make suggestions on how they could become more effective in their role through changes in their training and on-going support. Finally, they were asked to offer "words of wisdom" for new MSRTs. The responses to the free-response items were categorized by emergent themes.

Results

The results are presented first for the selected-response items and then for the free-response items. The selected-response items addressed the actions and perceptions of the Mathematics/Science Resource Teachers (MSRT) as they worked within their targeted schools. These items also addressed the preparation and support provided the MSRTs. The free-response items allowed the MSRTs to discuss their accomplishments and challenges, to make suggestions for changes that would allow them to be more effective, and to offer words of wisdom for new MSRTs.

Selected-Response Items

The Mathematics/Science Resource Teachers (MSRT) were responsible for providing support to teachers and schools in both mathematics and science. Table 1 displays common MSRT actions in order of frequency based on the combined percent of daily or weekly occurrence in schools. The frequencies in this table refer to the percent of schools in which an MSRT performed the indicated actions. Overall, MSRTs provided more frequent support in science than in mathematics. When the action items were ordered by frequency, the four highest ranked items involved science. Approximately half of the schools had MSRTs that supported science on a daily or weekly basis by providing teacher coaching/support in classrooms, modeling or team teaching science lessons, and participating in meetings with teachers to discuss the science curriculum.

In both content areas, the MSRTs were more likely to provide teacher coaching/support in classrooms than to model or team teach lessons. MSRTs provided teachers with coaching or support in their classrooms daily or weekly in 58 percent of the schools for science and in 44 percent for mathematics. MSRTs modeled lessons daily or weekly in 52 percent of the schools for science and in 40 percent for mathematics. MSRTs team taught lessons daily or weekly in 50 percent of the schools for science and in 36 percent for mathematics.

The participation of MSRTs in collaborative meetings with teachers varied greatly among the schools. MSRTs met with teachers for science on a daily basis in 15 percent of the schools and on a weekly basis in 31 percent of the schools. Whereas in 22 percent of the schools, the MSRTs only met with

teachers to discuss science once or twice a semester. Similar variation was noted for mathematics.

- **MSRTs also met with principals and school educational leaders. Meeting with the principal occurred in 31 percent of the schools on a weekly basis, 42 percent on a monthly basis, and 22 percent on a semesterly basis. Meetings with other educational leaders occurred in 14 percent of the schools on a daily basis, 31 percent on a weekly basis, 31 percent on a monthly basis, and 15 percent on a semesterly basis.**

Almost all schools involved MSRTs with performance assessments. This occurred in 43 percent of the schools on a daily or weekly basis and in 32 percent on a monthly basis.

Table 1. Common MSRT Actions in Order of Frequency (n=74 schools)

Item	Daily	Weekly	Monthly	Semesterly	Yearly	Not Done
I provided teacher coaching/support in classrooms for science.	18.9	39.2	20.3	8.1	0.0	13.5
I modeled science lessons for teachers in classrooms.	18.1	34.7	29.2	6.9	1.4	9.7
I team taught science lessons with teachers.	14.9	35.1	23.0	14.9	2.7	9.5
I participated in collaborative meetings with teachers to support their implementation of the MPS science curriculum.	14.9	31.1	27.0	21.6	1.4	4.1
I provided teacher coaching/support in classrooms for mathematics.	10.8	33.8	24.3	13.5	0.0	17.6
I met with educational leaders besides the principal to discuss current status of math and science and to collaborate toward next steps.	13.9	30.6	30.6	15.3	2.8	6.9
I provided support and assistance with mathematics and/or science performance assessments.	9.5	32.4	32.4	20.3	4.1	1.4
I modeled math lessons for teachers in classrooms.	12.5	27.8	25.0	25.0	1.4	8.3
I participated in collaborative meetings with teachers to support their implementation of the MPS mathematics curriculum.	9.5	29.7	31.1	20.3	1.4	8.1
I team taught math lessons with teachers.	8.1	28.4	21.6	25.7	1.4	14.9
I met with the principal to discuss the current status of mathematics and science and to collaborate toward next steps.	0.0	31.1	41.9	21.6	4.1	1.4

Table 2 displays infrequent MSRT actions in order of frequency based on the combined percent of semesterly, yearly, or not done occurrence in schools. The frequencies in this table refer to the percent of schools in which an MSRT performed the indicated actions.

Each year, every school in the district is required to develop a school educational plan. The MSRTs seemed to have little involvement in planning the educational plans in their schools for science and mathematics. About 45 percent of the schools did not involve MSRTs in planning the science portion of their educational plans and about 36 percent of the schools did not involve them in planning the mathematics portion. This finding is troublesome as one would think that the MSRTs could provide invaluable input into the development of these plans.

The MSRTs had more involvement in working with teachers to examine student achievement data in mathematics and science and to develop strategies to narrow achievement gaps. MSRTs worked with teachers on a daily basis in 21 percent and on a semesterly basis in 54 percent of the schools.

About 80 percent of the schools also involved MSRTs in conducting inservice sessions for their staff. The MSRTs conducted sessions monthly in 27 percent of the schools and semesterly in 39 percent of the schools.

The MSRTs were to assist the schools in developing broader communities of learners by engaging parents and the broader community in mathematics and science activities. About 72 percent of the schools involved MSRTs in parent activities and about 65 percent involved them in community activities. Most of this involvement only occurred on a very limited basis, usually once or twice a semester. This is most likely a reflection of the limited engagement of parents and the broader community in school science and mathematics activities in general.

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Table 2. Infrequent MSRT Actions in Order of Infrequency (n=74 schools)

Item	Daily	Weekly	Monthly	Semesterly	Yearly	Not Done
I assisted with school efforts that involved other community members besides parents in mathematics and science activities.	0.0	6.8	21.6	29.7	6.8	35.1
I conducted inservice sessions/workshops for teachers in the school.	0.0	1.4	27.0	39.2	12.2	20.3
I worked with teachers to examine student achievement data in math and science and develop strategies to close achievement gaps.	4.2	2.8	20.8	54.2	4.2	13.9
I planned inservice sessions/workshops for teachers in the school.	0.0	0.0	21.6	48.6	12.2	17.6
I assisted with school efforts that involved parents in math and science activities.	0.0	0.0	16.2	41.9	13.5	28.4
I helped plan the **math** portion of the school's educational plan.	1.4	2.7	6.8	21.9	31.5	35.6
I helped plan the **science** portion of the school's educational plan.	1.4	2.7	5.5	20.5	24.7	45.2

Table 3 displays MSRT perceptions of staff engagement, student interest, and administrative support in order of mean rating. The frequencies in this table refer to the percent of schools in which an MSRT had the indicated perception. The MSRTs felt very supported by the principals in most of the schools and perceived the existence of communities of learners around science and mathematics. The MSRTs also noted that staffs were attending more to equity issues since they became a MUSI school.

The MSRTs reported that students were becoming more interested in learning science since the schools became involved in MUSI, whereas interest in mathematics was not as strong. This may be reflective of the greater time commitment that MSRTs gave to science.

In 53 percent of the schools, time was not adequate for MSRTs to meet with teachers. On the other hand, 38 percent of the MSRTs felt they had adequate time to meet with teachers. Thus, perhaps the reason for the varied amount of meetings with teachers in science and mathematics as noted above is reflective of scheduling problems in some of the schools.

Table 3. Percent of Schools with Engagement, Interest, and Support in Order of Mean Rating (n=74 MUSI schools)

Item	Mean (SD)	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5
I feel supported by the principal of the school.	4.00 (1.23)	8.1	4.1	12.2	28.4	47.3
The students are more interested in learning **science** since the school became a MUSI school.	3.72 (0.88)	0.0	8.1	29.7	43.2	18.9
A community of learners exists around **mathematics** in the school.	3.60 (0.94)	4.1	6.8	25.7	51.4	12.2
A community of learners exists around **science** in the school.	3.53 (1.02)	5.4	10.8	18.9	54.1	10.8
The students are more interested in learning **math** since the school became a MUSI school.	3.42 (0.84)	0.0	10.8	45.9	32.4	10.8
The staff attends more to equity issues since they became a MUSI school.	3.26 (0.91)	1.4	20.8	31.9	40.3	5.6
I had adequate time to meet with teachers in the school.	2.82 (1.35)	17.6	35.1	9.5	25.7	12.2

Table 4 displays MSRT perceptions of their role, preparation, and support in order of mean rating. Most MSRTs (about 78 percent) enjoyed the challenge of being a

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Mathematics/Science Resource Teacher for MUSI. About 20 percent disagreed or were neutral in their response to enjoying the challenge. One of the challenges for the MSRTs was working with the staff in two schools and having to share time among two schools. About 56 percent of the MSRTs felt it was beneficial to work in two schools, whereas 37 percent did not find it beneficial.

Most MSRTs felt well-prepared to support both the mathematics and science curriculum. About three-fourths of the MSRTs agreed that they were well prepared to support the science program and the mathematics program. However, 80 percent also indicated they would like to be paired with another MSRT that was stronger in their weak content area. About half of the MSRTs stated that they were stronger in science and 43 percent stated that they were stronger in mathematics.

About 72 percent of the MSRTs agreed that their summer training was worthwhile, but only 39 percent felt the weekly seminars on Friday were valuable. About 75 percent of the MSRTs felt that the cadre of MSRTs formed a community of learners.

Table 4. Percent of MSRTs Responding on Role, Preparation, and Support in Order of Mean Rating (n=37 MSRTs)

Item	Mean (SD)	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5
Being an MSRT is a challenge that I enjoy.	4.14 (0.90)	0.0	5.4	16.2	35.1	43.2
I am well-prepared to support the implementation of a content-rich, inquiry-based curriculum in science.	4.08 (1.00)	0.0	13.5	10.8	35.1	40.5
I would like to be paired with another MSRT that is strong in what I consider to be my weak content area.	4.00 (1.01)	2.7	2.7	24.3	32.4	37.8
I am well-prepared to support the implementation of a content-rich, inquiry-based curriculum in mathematics.	3.89 (1.06)	0.0	16.2	10.8	40.5	32.4
The summer training for MSRTs was worthwhile.	3.89 (0.90)	0.0	8.3	19.4	47.2	25.0
I feel that the MSRTs are a community of learners.	3.58 (1.25)	8.1	13.5	13.5	40.5	24.3
I am stronger in science.	3.56 (1.34)	2.7	29.7	18.9	10.8	37.8
I am comfortable working in both content areasóscience and math.	3.56 (1.16)	2.7	24.3	13.5	37.8	21.6
I am stronger in mathematics.	3.31 (1.43)	10.8	21.6	24.3	10.8	32.4
I found the Friday Seminars valuable.	2.97 (1.18)	11.1	25.0	25.0	30.6	8.3
It was beneficial for me as an MSRT to work in two schools.	3.26 (1.42)	16.7	19.4	8.3	36.1	19.4

Free-Response Items

Table 5 displays the themes which emerged in response to the free-response items. The common themes are listed for each question. The number in parentheses indicate the number of responses identified within that particular category.

Table 5. Emergent Themes to Free-Response Items

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Free Response Items	Themes
Describe your biggest accomplishment this year as a Mathematics and Science Resource Teacher (MSRT).	↓ Provided support to teachers and saw change in instructional strategies and classroom practices (15) ↓ Became a part of a community of learners at the school (9) ↓ Contributed to changes in teachers' attitudes toward mathematics and science instruction (8) ↓ Assisted or initiated school-wide mathematics or science projects (5) ↓ Assisted in grant writing (5) ↓ Became accepted as a school staff colleague (4) ↓ Contributed to change in students' attitudes towards math and science (2)
Describe three things you did as an MSRT at each school that helped them to make progress in improving mathematics and/or science teaching and learning.	↓ Staff development (12) ↓ Modeled lessons/supplied resources for the classroom (10) ↓ Implemented and assisted with school-wide and community projects (7) ↓ Modeled curriculum and performance assessments (5)
What was the biggest challenge you had this year as an MSRT and what strategies did you try using in order to address this challenge?	↓ Managing time needed by both schools/meeting with teachers (9) ↓ Staff resistant to change (8) ↓ Attaining achieved credibility from school staff (6) ↓ Achieving trust/respect from administration and principals (4) ↓ Concerns with the MUSI leadership team and Friday seminars (3)
What impact on classroom practice have you noticed in your schools as a result of teachers participating in the UWM-MUSI courses and how were you able to support the teachers in implementing the ideas they were learning?	↓ Improved hands-on, cooperative, inquiry-based classroom Instruction (22) ↓ Enthusiasm and more openness to new ideas due to UWM-MUSI courses (9)
If you could change one thing next year so that you could be more effective as an MSRT, what would it be and how should it be changed?	↓ Time used to meet with teachers and be available at schools (11) ↓ Communication from school principals and MUSI leadership (10) ↓ Collaboration and learning with other MSRTs (9) ↓ Collaboration and learning with school staff (5)
What specific skills, information, or resources would have been helpful this year to make you a more effective MSRT?	↓ More training on curriculum and the standards through inservices (10) ↓ Resource library or lab at the cosmic center (6) ↓ Training on computer software technology (5) ↓ Sharing among MSRTs via networking and feedback (5) ↓ Additional training on leadership and coaching adults (4)
Comment on the Friday seminars for MSRTs. In what ways were they valuable?	↓ Valuable aspects of Friday seminars: interactive presentations, keeping informed of changes in the school system, support (17) ↓ Negative aspects of Friday seminars: disorganization, wasting of time, group too large to discuss effectively (8) ↓ Suggestions for next year: smaller grade-level groups, MSRT presentations, address specific curriculum more often (18)
What suggestions can you offer the MUSI leadership team that would help you become a more effective MSRT?	↓ Professional support through cutting edge curriculum knowledge and leadership training (10) ↓ Personal support through consistency, feedback, and a safe place to express opinions (10) ↓ Organizational adjustments such as a common vision and planned definitive meeting dates (6)

Accomplishments. The MSRTs were asked to describe their biggest accomplish. The dominant theme regarding was providing support to teachers and consequently seeing a change in their instruction and classroom practice. One MSRT commented that he/she was able to get "more teachers involved with using the MPS Science Kits and help the teachers to organize and plan hands-on math/science activities." Another MSRT noted that "the science lab at one of my schools is being used on a regular basis."

Another major theme involved becoming part of a community of learners at the schools. An MSRT described his/her biggest accomplishment as "getting teachers at my school to talk to other teachers about curriculum and how their teaching impacts the students' learning and test scores." Another explained, "My biggest accomplishment was generating discussions around the NCTM Standards during staff meetings at one of my schools. We looked at one standard at a time and I gave activities for teachers to use that supported that standard. A small committee developed a rubric for the school to use to evaluate problem-solving and mathematics communication."

The other major theme for this question involved contributing to changes in teachersí attitudes toward mathematics and science instruction. As one MSRT noted, "My biggest accomplishment this year as an MSRT was getting the staff at one of my schools to get over their fear and anxiety of teaching science and using the science kits." Other emergent themes included school-wide mathematics or science projects, grant writing, becoming accepted as part of the school staff, and changing student attitudes.

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Progress towards improving teaching and learning. The MSRTS were asked to describe three things they did at each school that helped them to make progress in improving mathematics and/or science teaching and learning. Two dominate themes emergedóproviding or connecting teachers with staff development sessions and modeling lessons/supplying resources for the classroom. One MSRTs explained that presenting inservices "worked well because it built a group of teachers who wanted to converse about current district initiatives. The dialogue opened up the lines of communication for me. Teachers would openly state what they needed and together we discussed how we could accommodate those needs. Inservices increased the amount of sharing of expertise within the building." Other themes included implementing and assisting with school-wide and community projects and working with performance assessment.

Challenges. The MSRTs were asked to describe the biggest challenge they had this year and the strategies they used to address this challenge. The dominant themes included the management of time in working with the staffs at two schools and working with individuals who were resistant to change. An MSRT explained, "My biggest challenges were scheduling and planning with teachers, working with all teachers, and working in the area of math. For scheduling and planning, I used content area meeting times and Saturday inservices. For working with all teachers, I had no strategy. For working with math, I had other MSRTs assist with math content when it was needed."

Other themes included achieving credibility with school staff, achieving trust and respect from administration and principals, and working with the MUSI leadership team. An MSRT commented, "Being accepted as one who supports and not threatens [was the biggest challenge]. I was very low key and laid back but was always there. I started getting requests and teachers espread the wordí about how helpful I was and about the good ideas I have to share."

Support for university courses. The MSRTs were asked to comment on the impact on classroom practice they had noticed in their schools as a result of teachers participating in the university courses associated with MUSI and to describe how they were able to support the teachers in implementing the ideas they were learning. The dominant theme was improved hands-on, cooperative, inquiry-based classroom instruction. An MSRT described the impact in classroom practice as including "more hands-on activities and more open-ended teaching styles, as well as teachers being more open to me as an assisting person as they tried things they learned in the courses. I supported teachers by assisting as they tried lessons and then discussed with them how the lesson went and what they learned about this type of instruction and strategy." Another MSRT noted, "The two staff members who took the science standards course began talking to each other and helping each other on a professional basisósome thing they had not done before. Other staff noticed this and commented on it. Things that had previously been hidden from each other were shared. Things appeared that had never been seen before. It was like the miracle of the fish and the bread. I asked them questions and waited for solutions to appear."

The other major theme regarding the impact of the university courses was increased enthusiasm among teachers and more openness to new ideas. An MSRT described, "All of the teachers were raving about how wonderful the courses were. Even the principal participated. I was asked to observe in three classrooms and then conference with the teachers as part of a course assignment." Another explained, "Teachers were excited. It generated conversation about science and math. It increased conversation with the MSRT. It inspired others to take classes."

Change one thing. The MSRTS were asked, "If you could change one thing next year so that you could be more effective as an MSRT, what would it be and how should it be changed?" The dominant theme involved the time used to meet with teachers and be available at schools. Some MSRTs planned to change their weekly schedule so they could be at each school each week or to restructure their daily schedule. Others noted that they needed to add more hours to the day and more days to the week or would like to only be assigned to one school.

Another dominant theme included communication between school principals and MUSI leadership. MSRTs wanted their work in the building to be more clearly defined, more support from administrators, and a clearly articulated vision from top district officials.

The other major themes involved collaboration and learning with other MSRTs and collaboration and learning with school staffs. One MSRTs explained, "I would work with another MSRT in my weak content area." Another noted that he/she wanted more time for collaboration with other MSRTs that consisted of both professional development and planning time.

Needed skills, information, and resources. The MSRTS were asked to describe the specific skills, information, or resources that would have been helpful this year to make them a more effective MSRT. The dominant theme involved the need for more training on curriculum and the standards. One MSRT wanted "more information about the MPS curriculum in math and science early in the year." Another noted that he/she wanted more information on the standards and how the district curriculum is aligned with the standards. Other themes that emerged were a need for access to a resource library or lab, more training on computer software technology, more sharing among MSRTs via networking and feedback, and additional training on leadership and coaching adults.

Weekly seminars. The MSRTS were to comment on the Friday seminars and discuss ways in which they had been valuable. Most comments were positive. The MSRTs felt they could get support from other MSRTS during these seminars. One MSRT explained, "The Friday seminars were valuable when we got into smaller groups and brainstormed on items specifically pertaining to our role as MSRTs." They also appreciated being kept informed of changes in the school system; "The Friday seminars were of great value. We were informed on what was going on in the school system and on workshops on math/science resources that were available for us."

Some of the negative aspects of Friday seminars included disorganization, wasting of time, and the ineffectiveness of discussing in such a large group. One MSRTs commented, "Much of the time was a real waste listening to people read announcements or other things that did not pertain to what I was doing in my schools." Another reflected, "Many Fridays I left wondering what I had just done for seven and a half hours."

The MSRTs had many suggestions for making the weekly seminars more valuable. Such as working in smaller grade level networking groups, allowing MSRTs to conduct and facilitate presentations, and to address specific curriculum issues more often. An MSRT suggested, "Need formal structure such as clusters to get and give feedback concerning MSRT actions in schools and MSRT working committees that plan and present on Fridays." Some MSRTs also suggested that MSRTs meet bi-weekly or monthly rather than on a weekly basis.

MUSI leadership. The MSRTs were to make suggestions to the MUSI leadership team that would help them become a more effective MSRT. The two dominant themes involved the need for more cutting edge knowledge of the curriculum and leadership training and the need for more personal support through consistency, feedback, and a safe place to express opinions. One MSRT noted that he/she would like "more opportunities to experience hands,-on minds-on, content-rich, inquiry-based science." Another wanted, "more leadership training on how to be a successful change agent."

The other major theme involved suggestions for organizational adjustments such as the articulation of a common vision and the establishment of a clear timeline.

Words of wisdom. Finally, the MSRTs were asked, "What words of wisdom can you offer the new MSRTs that will be joining MUSI?" The MSRTs encouraged new MSRTs to identify strengths and weaknesses and be open to ask for help, to work towards becoming part of a school teamónot an expert, to find a support system within the cadre of MSRTs, and to view conflict as an opportunity for growth. One MSRT advised, "I think it is vitally important to be honest with yourself, identify your strengths and weaknesses, be open and honest with your staffs regarding the above, and look for assistance at your schools. Donít let the principal or the staff see you as an "expert" coming in to fix things. Be a part of the team, working together to help the students." Another MSRT advised, "Be sure to communicate and share with fellow MSRTs. Make contact with MSRTs who have been thereóget their advice and support often. Don't be afraid to question." One other MSRT advised, "Being an MSRT can be exciting and fun. It allows motivated, dedicated people to excel and show their stuff. . . . But it is not a job for those looking for a vacation. An MSRT has to be ready to work hard, work with challenging people, and be ready to put in some long days."

Discussion

The Mathematics/Science Resource Teachers (MSRT) are a central component of the Milwaukee Urban Systemic Initiative (MUSI). During the first two years of the initiative, this cadre of 40 resource teachers has had significant one-on-one contact with teachers in the context of school communities. This discussion of their work

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will be framed within the professional development model of Lieberman and Miller (1992).

Colleagueship

The MSRTs did not enter their targeted schools believing they were experts who were there to train teachers on how to teach mathematics and science. Rather, they entered the schools with the intent to work with teachers and staff members and to help the school build capacity for improving mathematics and science teaching and learning. Thus, the MSRTs viewed their work as designed around the two elements of the Lieberman and Miller professional development modelónotions of colleagueship, openness, and trust and their role as colleagues, helpers, and developers.

The MSRTs met collaboratively with individual teachers and groups of teachers to support their implementation of the district science and mathematics programs. They also met with the principal and educational leaders in the school to discuss the current status of the science and mathematics programs in order to collaborate toward next steps. However, several MSRTs expressed concern that they were not accepted with the openness and trust they expected or that they encountered staff members that were resistant to change. For some, a significant accomplishment during the second year of implementation was having finally achieved a level of openness and trust from which they could work during the following year. Most, but not all, MSRTs also noted strong support from principals. Thus, one could speculate that the schools which were able to establish notions of colleagueship, openness, and trust early during the school year were more likely to move further in their improvement of science and mathematics.

Disciplined Inquiry

Another element of the professional development model involves providing opportunities and time for disciplined inquiry or action research. Providing teacher coaching and support in classrooms for science and mathematics was a common MSRT action. However, it is not clear whether these efforts were driven by teacher needs and were problem based or whether the resource teachers were serving as assistants in the classrooms. Since many of the MSRTs noted that they did not have adequate time to meet with teachers, it is likely that they many were not able to assist teachers in developing plans for disciplined inquiry including the monitoring of practice. However, a few of the MSRTs did comment on targeted and focused examples of disciplined inquiry. For example, through a combination of modeling, team teaching, coaching, and conferencing a science teacher, one MSRT was able to help the teacher change the classroom climate in his room from a rather rigid punitive environment to a much more open, accepting, and equitable one. Most of the comments by the MSRTs referred to more general assistance rather than specific examples of disciplined inquiry.

Learning of Content in Context

The focusing of teacher learning of content in context was a key feature of the work of the MSRTs. This element of the professional development model was embedded in the design of the resource teacher position and in their work. Each MSRT worked with two schools in the areas of mathematics and science. They were not generalists, but targeted specific content. Each MSRT spent approximately two days in each school each week. In practice, many spent four days in one school one week and then four days in the other school the following week. This extensive and sustained work in a limited number of schools allowed the MSRTs to focus their work with teachers within the context of his or her school, as opposed to many other professional development models in which the teachers "go out" to get professional development and then are suppose to bring back the ideas to implement. The MSRTs helped to plan and conduct inservice sessions for teachers within their targeted schools, they met with grade level and other small groups of teachers, and they worked with parents and community members associated with those schools. All of these efforts helped them to establish their work within the context of each school.

Networking Beyond the Boundaries of the School

Through the systemic initiative, there were also some district-wide opportunities for teachers to "go out" and get professional development such as with the university courses. Teams of teachers from a school were required in order to participate in these courses. This might have helped build the enthusiasm noted by the MSRTs as the teachers returned to their schools. Also, the support of the MSRT within the school was probably a key factor in the success of the courses and the implementation of the ideas within classrooms. The synergy between the learning of a group of teachers from a school and the available support of the MSRT within the school is a model of professional development that needs further examination.

Some MSRTs noted that they were able to share ideas and resources among their two schools. Thus, they served as the link between the schools. A few MSRTs also noted successful efforts to bring together the teachers from both of their schools for inservice sessions.

The cadre of MSRTs themselves also represented a network that established connections beyond the boundaries of individual schools. During the weekly seminar, MSRTs were able to learn more about district efforts and best practice. However, the MSRTs often noted that they wanted more time to have discussions with other MSRTs about specific practices that were working in other schools in order to get ideas to better help their own schools.

Leadership

Two elements of the professional development model related to leadership. One element is to provide opportunities that lead to new leadership roles and the other element is that leadership must be collaborative. The design of the MSRT model allowed teachers to enter into a role that provided them with leadership roles at both the district-level and at the school- level. Since these positions are full-time, teachers must leave a classroom position in which they have been working with children and enter into a position in which they are now working with adults. The summer training and the weekly seminars provided the MSRTs with an opportunity to develop their leaderships skills. However, several MSRTs noted the need for additional leadership development.

Within the schools, several MSRTs noted that they tried to be participatory leaders. They met with teachers, school leaders, and the principal in order to be part of the leadership structure with the school. Some MSRTs noted that they were viewed as one of the leaders in the schools in regards to mathematics and science, whereas others felt that they were regarded only as a resource. The lack of leadership acceptance is evident in the many schools in which the MSRTs were not involved in developing the mathematics and science portions of the schoolsí educational plans.

Conclusion

This paper provided evaluation data concerning the development and implementation of a resource teacher program in one of the urban systemic initiative sites during its second year of implementation. The professional development model in this urban systemic initiative is based upon a model presented by Lieberman and Miller (1992). Within the reform of mathematics and science in this large urban district, some elements of the model have been able to manifest themselves and others have presented challenges and struggles.

The resource teachers entered the schools with notions of colleagueship, but this was not always reciprocated from those within the schools. The resource teachers attempted to help teachers improve their practice through disciplined inquiry, but often specific problems were difficult to identify and target. The resource teachers targeted their work in mathematics and science within the context of the schools, but many noted there was not enough time to work with all teachers to the extent needed. The resource teachers helped teachers establish some networking beyond the boundaries of the school, but they themselves felt they needed more opportunities to network themselves. The resource teachers were placed into leadership roles, but while some strived in these positions others were not ready to accept the role of being a leader or did not develop the needed skills.

This large urban district has embarked on a journey of professional development unlike the traditional "one size fits all" model. The professional development is dynamic, evolving, and clearly based within the context of the schools.

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Appendix: Questionnaire

Mathematics/Science Resource Teacher Reflections and Feedback

Note: All responses are anonymous. In the items that ask for a response for each school, please be consistent so that School A responses always refer to the same school as should the responses for School B.

Part 1: Selected-Response Items

1. How many years have you been a Mathematics/Science Resource Teacher for MUSI?

One Year_____ Two Years_____

Use the following choices to respond to items 2ñ19.

D: Daily (or almost daily when you were in the school)

W: Weekly (when you were in the school)

M: Monthly

S: Once or twice a semester

Y: Yearly (one time during the year)

N: Choose not to use this strategy or was not able to do this

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Item	School A	School B
2. I participated in collaborative meetings with teachers to support their implementation of the MPS **science** curriculum.		
3. I participated in collaborative meetings with teachers to support their implementation of the MPS **mathematics** curriculum.		
4. I **planned** inservice sessions/workshops for teachers in the school.		
5. I **conducted** inservice sessions/workshops for teachers in the school.		
6. I provided support and assistance with mathematics and/or science performance assessments.		
7. I met with the principal to discuss the current status of mathematics and science and to collaborate toward next steps.		
8. I met with educational leaders besides the principal to discuss current status of math and science and to collaborate toward next steps.		
9. I helped plan the **science** portion of the school's educational plan.		
10. I helped plan the **math** portion of the school's educational plan.		
11. I worked with teachers to examine student achievement data in math and science and develop strategies to close achievement gaps.		
12. I modeled **science** lessons for teachers in classrooms.		
13. I modeled **math** lessons for teachers in classrooms.		
14. I team taught **science** lessons with teachers.		
15. I team taught **math** lessons with teachers.		
16. I provided teacher coaching/support in classrooms for **science**.		
17. I provided teacher coaching/support in classrooms for **mathematics**.		
18. I assisted with school efforts that involved parents in mathematics and science activities.		
19. I assisted with school efforts that involved other community members besides parents in mathematics and science activities.		

Indicate the degree to which you agree or disagree with each statement below. For items 20-26, please write in the appropriate response using the following choices. For items 27-38, please circle the appropriate response.

SA A N D SD

Strongly Agree Agree Neutral Disagree Strongly Disagree

Item	School A	School B
20. A community of learners exists around **science** in the school.		
21. A community of learners exists around **mathematics** in the school.		
22. The students are more interested in learning **science** since the school became a MUSI school.		
23. The students are more interested in learning **mathematics** since the school became a MUSI school.		
24. The staff attends more to equity issues since they became a MUSI school.		
25. I feel supported by the principal of the school.		
26. I had adequate time to meet with teachers in the school.		

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27. It was beneficial for me as an MSRT to work in two schools.	SA A N D SD
28. I am well-prepared to support the implementation of a content-rich, inquiry-based curriculum in **science**.	SA A N D SD
29. I am well-prepared to support the implementation of a content-rich, inquiry-based curriculum in **mathematics**.	SA A N D SD
30. I am comfortable working in both content areas/science and math.	SA A N D SD
31. I am stronger in science.	SA A N D SD
32. I am stronger in mathematics.	SA A N D SD
33. I would like to be paired with another MSRT that is strong in what I consider to be my weak content area.	SA A N D SD
34. I feel that the MSRTs are a community of learners.	SA A N D SD
35. I found the Friday Seminars valuable.	SA A N D SD
36. The summer training for MSRTs was worthwhile.	SA A N D SD
37. Being a Mathematics/Science Resource Teacher (MSRT) for MUSI is a challenge that I enjoy.	SA A N D SD

Comments (Provide explanatory comments for any items or add your own items. Use the back if needed.)

Part 2: Free-Response Items

You may respond to the following items by handwriting your responses or by typing them into a word processor on a computer. Just number each of your responses to correspond to the questions below. If you use a computer, it would be helpful if you turn in both a hard copy and a computer file (some blank disks will be available for this purpose), but do what you feel comfortable with in regards to turning in your responses to these open-ended items.

1. Describe your biggest accomplishment this year as a Math/Science Resource Teacher (MSRT).

2. Describe three things you did as an MSRT at each school that helped them to make progress in improving mathematics and/or science teaching and learning.

3. What was the biggest challenge you had this year as an MSRT and what strategies did you try using in order to address this challenge?

4. What impact on classroom practice have you noticed in your schools as a result of teachers participating in the UWM-MUSI courses and how were you able to support the teachers in implementing the ideas they were learning?

5. If you could change one thing next year so that you could be a more effective MSRT, what would it be and how should it be changed?

6. What specific skills, information, or resources would have been helpful this year to make you a more effective MSRT?

7. Comment on the Friday Seminars for MSRTs. In what ways were they valuable? What changes would you like to see made?

8. What suggestions can you offer the MUSI leadership team that would help you become a more effective MSRT?

9. What "words of wisdom" can you offer the new MSRTs that will be joining MUSI?

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